

NHTSA Compatibility Crash Test Update

Vehicle Crash Test Program on Compatibility in Front-to-Front Impacts

2007 SAE Government/Industry Meeting
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Presentation Outline

- Evaluation of Option 1 Pickup
 - ⇒ Pickup vs. Medium compact car
- Evaluation of Option 2 Pickups
 - ⇒ Pickups vs. Soft compact car
 - ⇒ Override barrier (ORB) test development for Secondary Energy Absorbing Structures (SEAS)
 - 06 Ford F-250 Super Duty test
 - 06 Honda Ridgeline test
- Observations

Pickup vs. Medium Compact Car

Option-1 LTV, Hill 50th Male, Delta V Civic - 45 mph



Test 1



Test 2

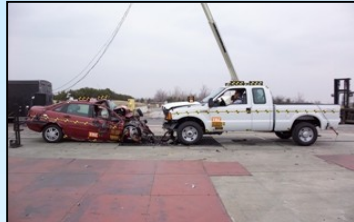
	AHOF (mm)	Kw400 (N/mm)	Civic Driver (HIC15)	Civic Driver Chest (G)	Test 1 Crush (mm)	Test 2 Crush (mm)
01 Civic 2 door	382	1265			882	676
Bullet Vehicles						
03 Silverado Test 1 (Matched Rails)	511	1619	0% (315)	0.8% (59)	496	
03 Silverado-Lowered 5.5 in. Test 2 (Matched AHOF)	371 (-140)	1619	0% (400)	0.6% (55)		727

- Test 1 Rails matched, crossmember gave override
- Test 2 AHOF₄₀₀ matched, rails missed each other, no override
- Low probability of fatality in both tests

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Pickups vs. Soft Compact Car

Option-2 LTVs, Hill 50th Male, Delta V Focus - 45 mph



F-250 - Focus



Ridgeline - Focus

Make & Model	Focus Driver Head (HIC15)	Focus Driver Chest (Chest G)
02 Focus		
Bullet Vehicles		
06 F-250 w/o SEAS	25% (1583)	10% (99)
06 F-250 with SEAS	10% (1023)	5% (86)
06 Ridgeline with SEAS (Unibody)	90% (3448)	15% (106)

- F-250 SEAS reduced probability of fatality by 15%
- Steering wheel deformation causes high HIC in Ridgeline test

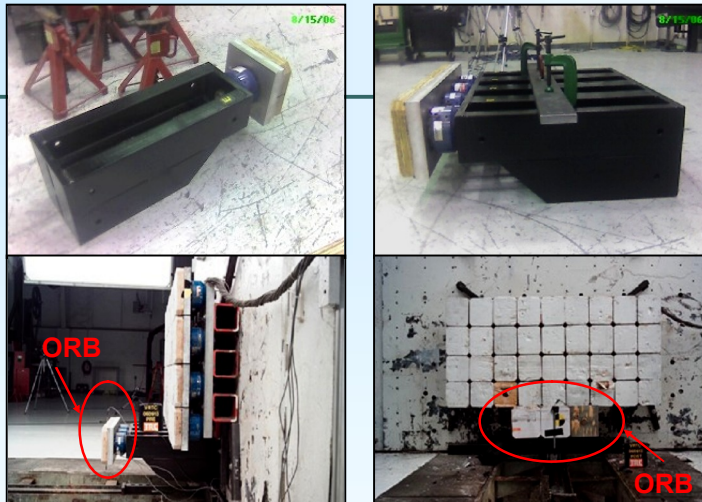
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Override Barrier for SEAS Evaluation

- Evaluate energy absorption through the SEAS
 - ⇒ Evaluate Kw400 of SEAS to match energy absorption with passenger cars
 - ⇒ Some preliminary modeling and testing was done in 2006

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Override Barrier Concept



- Single row of 250x250 mm load cells, single-axial force, 210 kN,
- Adjustable by height, width, and depth for preliminary experiments
- Designed to engage the SEAS and measure its energy absorption

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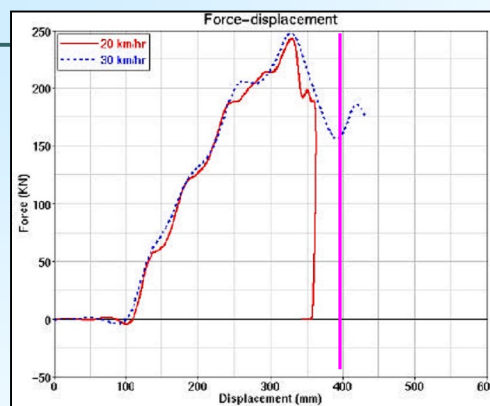
Override Barrier (ORB) Modeling



- The F-250 SEAS was modeled in a tear down study
- The SEAS was then fit to MY 1998 Econoline van model (above) ballasted to the F-250 weight for a test speed study

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SEAS Test Speed Study



- 400 mm of deflection of the SEAS for Kw400 needs 500mm in this chart
- An initial test speed of 25 mph was selected from these data

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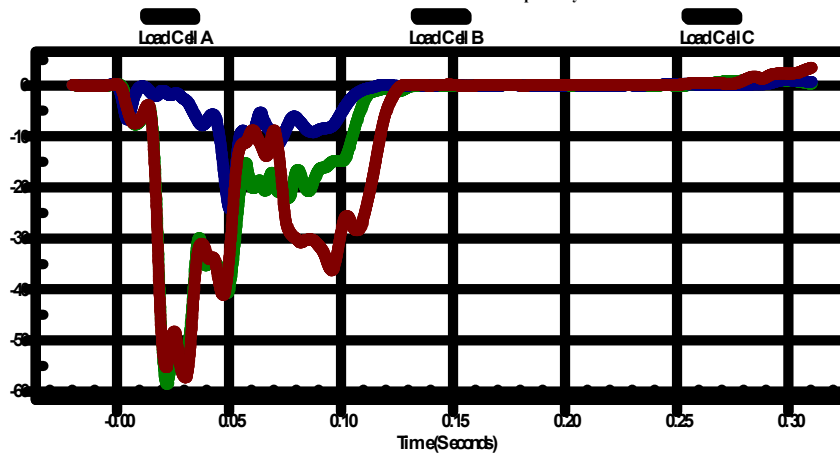
06 Ford F-250 ORB Test 25 mph



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Load Cell Forces F-250 ORB Test

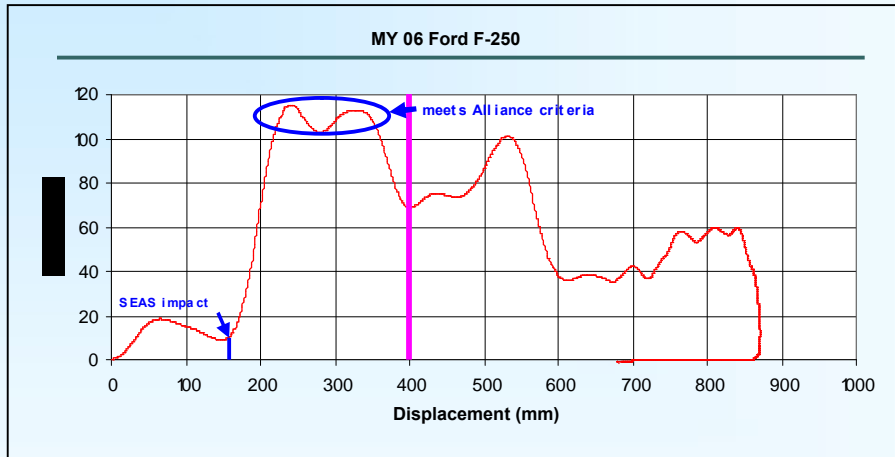
Forces by Load Cells - ORB
Test No. 5881 - 2006 Ford F250 Super Duty



- No load cells were saturated
- End brackets generated higher forces

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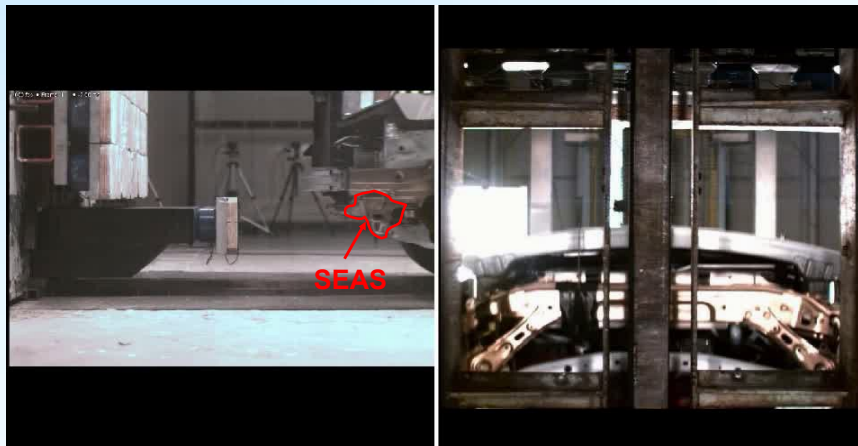
Force-Displacement F-250 ORB Test



- No damage to load cells were observed
- SEAS Kw400 = 262 N/mm (very soft)

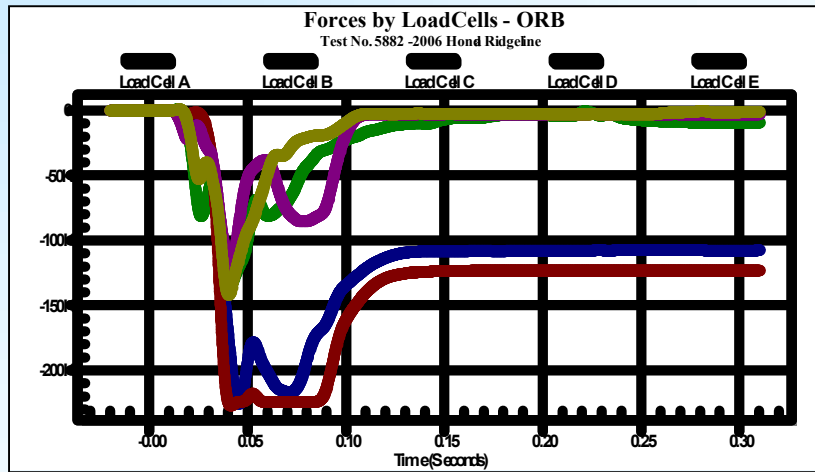
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06 Honda Ridgeline ORB Test 25 mph



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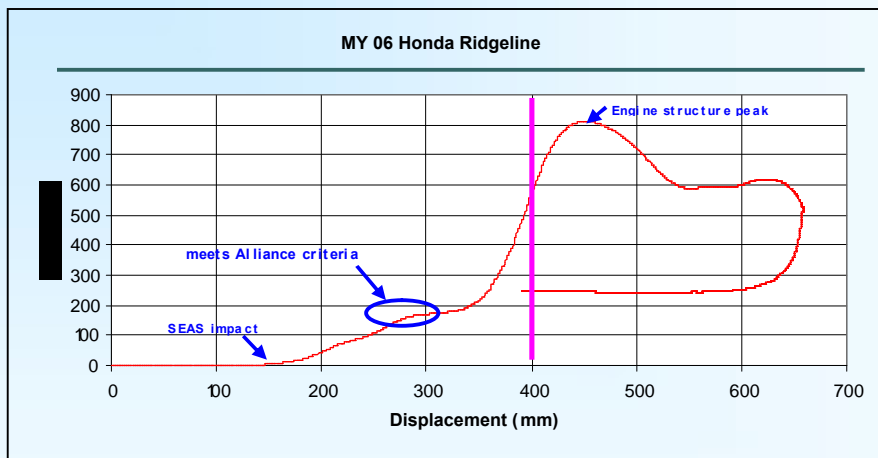
Load Cell Forces Honda Ridgeline ORB Test



- Load cells B and C were saturated
- Engine impact is a cause of this failure

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Force-Displacement Honda Ridgeline ORB Test



- May need to revisit load cell design for maximum force
- SEAS Kw400 = 446 N/mm

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Observations

- Option 1 pickups were tested vehicle-vehicle
 - ⇒ Cross members were seen to control the crush regardless of rail alignment
 - ⇒ AHOF400 predicted both override and no -override of the structures
 - Option 2 pickups were tested
 - ⇒ Vehicle-Vehicle tests were performed
 - The added F-250 SEAS showed marked improvement in partner HIC15 response
 - ⇒ Pickups were tested against a prototype override barrier
 - The override tests showed that more development is needed
- Next steps
 - ⇒ Perform vehicle-vehicle offset tests to determine if Kw400 remains a good predictor of injury performance
 - ⇒ Perform a second round of override barrier tests following finite element modeling experiments with F-250 model

Thank You

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